REMARKS

Applicants gratefully acknowledge the Examiner's consideration of arguments made in response to the Office Action mailed December 8, 2003, and the Examiner's withdrawal of the rejection of Claims 1-27 as made therein.

Claims 1-27 are currently pending in the application. Claims 1, 14, 22, and 23 are amended to clarify that each fingerprint scanner is "incorporated into a pointing device." Support for such amendment can be found in the Specification at page 3, lines 6-10; page 4, lines 10-12; page 5, lines 9-11; page 7, lines 7-11; and in Figure 1. In addition, certain amendments have been made to correct informalities. Claim 1 is amended by changing "an" to "and" in line 1; Claim 11 is amended by inserting the word "of" in line 1; Claim 13 is amended by adding a period to the end of the sentence; and Claim 15 is amended by changing "are" to "is" in line 2. No new matter is added.

In response to the Examiner's inquiry, Applicants confirm that the subject matter of all claims was commonly owned at the time of invention.

The Claimed Invention

The claimed invention concerns a method and systems combining the functionality of a computer pointing device with that of a fingerprint authentication system.

Most mobile computers currently incorporate some kind of pointing device, because pointing devices are essential for using widely-adopted operating systems and applications, including (without limitation) Microsoft Corporation's Windows, Apple Corporation's Mac OS, and many applications running under them. Beginning with the now-traditional mouse, a wide variety of pointing devices have been introduced, including trackballs, touchpads, and various mechanical pointers. Pointing devices other than the traditional mouse are more likely than the traditional mouse to be used with mobile computers, because mobile computers are often used in public places in which the large, flat space necessary for operating a traditional mouse is not available.

Not only are mobile computers likely to be used in places that are inconvenient for operating a traditional mouse, they are also likely to be used in unsecured areas where unauthorized persons might attempt to use or access the computer. Notwithstanding potential security risks, mobile computer users may view themselves as unable to avoid having confidential or proprietary information stored on their computers. Mobile telephones, personal digital assistants, and other portable electronic devices present similar security risks and, even if they do not contain confidential or proprietary information, may present risk of a financial loss if used by unauthorized persons.

Existing security systems for mobile computers and other portable electronic devices require active intervention by the user, such as by entering a password or locking and unlocking the device with a key. The perceived inconvenience of frequent password entry and of frequent locking and unlocking, in conjunction with users' fears of misplacing or forgetting a password or key, may result in failure to use existing security systems. Thus, difficulty-of-use issues may prevent existing security systems from being used adequately to safeguard mobile computers and other portable electronic devices.

In view of the desirability of a security system for mobile computers and other portable electronic devices, and in view of the widespread use of pointing devices on mobile computers and other portable electronic devices, one potentially attractive solution to the security problem is to employ a pointing device incorporating a fingerprint scanner. Powerful processors and algorithms, coupled with new, more compact fingerprint scanners, have made possible the automatic verification of fingerprints on small computer platforms, which typically have pointing devices built in anyway. Use of a combined pointing device and fingerprint scanner may allow for user authentication when the pointing device is touched, without requiring separate intervention by the user in forms such as entering a password or locking and unlocking the device with a key.

The claimed invention thus combines the functionality of a computer pointing device with a fingerprint authentication system. In the preferred embodiment, there is shown a computer 100, having as screen 110 and keyboard 120. Computer 100 is shown

in Figure 1 with a combined fingerprint scanner and pointing device scanner130 according to the claimed invention. Figure 2 shows a diagram of a fingerprint scanner surface 210 with an acquired fingerprint image 220. Fingerprint scanner surface 210 corresponds to the functional area of scanner 130. The portion of the surface area of scanner 130 which comprises scanner surface 210 depends upon the function characteristics of scanner 130, which may vary depending on the image acquisition method employed by scanner 130. By regularly scanning fingerprints acquired from the pointing device touch pad, fingerprint features may be extracted and compared to stored data on authorized users for passive authentication. The presently preferred embodiment of the claimed invention calculates a center-of-area or centroid 230 of fingerprint image 220. Centroid 230 has an associated two dimensional coordinate relative to fingerprint scanner surface 210, which in Figure 2 is represented as an x-coordinate 240 and a y-coordinate 250. The choice of coordinate systems is arbitrary, and may be chosen to facilitate computations related to the specific or general application of the device according to the claimed invention. This calculation is performed with each fingerprint image collected.

U.S. Patent No. 5,400,836 to Senior employs the steps of viewing the fingerprint as an elliptical region, using such view to find rotation in the plane of the scanner, and finding the principle axes of this region. It has been found, however, that the reliability of that scanning method could be improved in certain cases, such as where finger pressure is light, where only the very tip of the finger is used, and where the finger is at the edge of the scanning area.

It is therefore an object of the claimed invention to provide a new and improved method and systems to calculate the appropriate parameters and to use the parameters thus calculated. It is also an object of the claimed invention to provide an improved method and systems to calculate rotational information for a fingerprint.

The Examiner has rejected Claims 1-6 and 11-13 under 35 U.S.C. § 102(a) as being anticipated by U.S. Patent No. 5,717,777 to Wong et al. The Examiner has also

rejected Claims 7-9 under 35 U.S.C. § 103(a) as being unpatentable over Wong et al. in view of Japanese Patent No. 04158434 to Matsubashi. The Examiner has further rejected Claim 10 under 35 U.S.C. § 103(a) as being unpatentable over Wong et al. in view of U.S. Patent No. 5,999,637 to Toyoda et al. Finally, the Examiner has rejected Claims 14-27 on the basis that such claims are claiming subject matter combinations of rejected Claims 1-13 and are therefore rejected for the same reasons. Applicants respectfully traverse all such rejections as discussed below.

Rejection of Claims 1-6 and 11-13

The Examiner has rejected Claims 1-6 and 11-13 under 35 U.S.C. § 102(a) as being anticipated by U.S. Patent No. 5,717,777 to Wong et al., which describes a longest line method and apparatus for fingerprint alignment. Wong et al. does not describe the combination of a fingerprint scanner with a pointing device or any other feature of a mobile computer or other portable electronic device.

Claim 1. Independent Claim 1 has been amended to clarify that the fingerprint scanner is "incorporated into a pointing device." As noted above, Wong et al. does not discuss combining a fingerprint scanner with a pointing device or any other feature of a mobile computer or other portable electronic device, whereas such a combination is a principal feature of the claimed invention.

The Examiner has found the limitation of Claim 1, concerning the acquisition through a scanner of at least two fingerprint images of a finger, to be anticipated by a discussion in the specification of Wong et al. The technique discussed by Wong et al. is distinct from Claim 1, however, because the only one fingerprint image (from which are taken "live coordinate points" to be compared to "reference coordinate points") is taken by Wong et al. (Wong et al., column 1, line 64 through column 2, line 4) In Claim 1 of the claimed invention, authentication may be based on more than a single live fingerprint scan, in contrast to the one live fingerprint scan employed for authentication in the cited passage from Wong et al. The Examiner acknowledges as much in discussing of Claims 11-13. (Office Action at 3) The ability of the claimed invention to require more than a single live

fingerprint scan for authentication may be useful for purposes such as preventing "replay attacks" using stored fingerprints to gain unauthorized access. (Specification, page 11, lines 12-18)

The Examiner has also found the limitation of Claim 1, "to authenticate said user and to control said electronic device," to be anticipated by a discussion in the specification of Wong et al. Applicants, however, have not been able to find reference to the term "electronic device" either in the cited passage (Wong et al., column 2, lines 1-15) or elsewhere in Wong et al. In addition, Wong et al. is directed to controlling "access to a protected area" (Wong et al., column 1, lines 65-66) and does not appear to discuss or to contemplate use of fingerprints to control access to electronic devices.

Applicants thus respectfully submit that Claim 1 is not anticipated by Wong et al. and should be allowed.

Claims 2-4. The Examiner has found limitations of dependent Claims 2-4, relating to the use of "rotation," "translation," or "pitch and roll" in determining a contact parameter, to be anticipated by a discussion in the specification of Wong et al. However, where the reference discusses translation and rotation of a single live fingerprint image in order to compare it to a reference image (Wong et al., column 2, lines 10-14), Claims 2-4 derive from base Claim 1 the flexibility to permit authentication based on a comparison of two or more scanned fingerprint images to a reference fingerprint. In addition, there is no discussion of "pitch and roll" (Claim 4) in Wong et al. Applicants thus respectfully submit that Claims 2-4 are not anticipated by Wong et al. and should be allowed.

Claims 5-6. The Examiner has found limitations of dependent Claims 5-6, relating to the step of "computing image correlations" for a "single portion" of a fingerprint image (Claim 5) and for a "multiplicity of small regions" (Claim 6), to be anticipated by a discussion in the specification of Wong et al. The discussion in Wong et al., however, merely states that certain metrics derived from the live fingerprint are to be compared to reference metrics, "validating the identity when the candidate set of metrics substantially corresponds with the reference set of metrics." (Wong et al., column 4, lines 35-36)

There is no discussion in Wong et al. of making such comparison on the basis of a "single portion" of a fingerprint image or a "multiplicity of small regions" as in Claims 5-6. (As discussed above, and in the Specification at page 2, lines 21-24, one problem addressed by the claimed invention is that reliability had been found to suffer when only the tip of the finger was used.) Applicants thus respectfully submit that Claims 5-6 are not anticipated by Wong et al. and should be allowed.

Claims 11-13. The Examiner found limitations of dependent Claims 11-13 that "at least one of said fingerprint images is a reference image captured previously" to be anticipated by a passage from Wong et al. discussed in connection with Claim 1, above. (Wong et al., column 1, line 64 through column 2, line 4) Claims 11-13 derive from base Claim 1 the limitation that the claimed method is "for an electronic device" (Claim 1). As discussed above in connection with Claim 1, Applicants could not find reference to the term "electronic device" in Wong et al. In addition, Wong et al. is by its own terms directed to controlling "access to a protected area" (Wong et al., column 1, lines 65-66) and does not appear to discuss or to contemplate techniques to control access to electronic devices. Applicants thus respectfully submit that Claims 11-13 are not anticipated by Wong et al. and should be allowed.

Rejection of Claims 7-9

The Examiner has rejected dependent Claims 7-9 under 35 U.S.C. § 103(a) as being unpatentable over Wong et al. in view of Japanese Patent No. 04158434 to Matsubashi, which describes a pointing device for display devices. Applicants respectfully traverse the Examiner's threshold finding that "Wong discloses the invention substantially as claimed in and as described above in claim 1" (Office Action at 4) and hereby incorporate by reference the discussion of the rejection of Claim 1 (from which Claims 7-9 depend) as set forth above. In addition, while Matsubashi describes a pointing device combined with a fingerprint detection means, Matsubashi does not provide that the scanner acquire "*at least* two images of a finger." (Claim 1, lines 3-4) (emphasis added) As discussed above, the ability of the claimed invention to require more than a single live

fingerprint scan for authentication may be useful for purposes such as preventing "replay attacks" using stored fingerprints to gain unauthorized access. (Specification, page 11, lines 12-18) Matsubashi does not provide such a capability. In view of such discussion, a combination of Wong et al. with Matsubashi would not result in Claims 7-9. Applicants thus respectfully submit that Claims 7-9 are patentable over Wong et al. in view of Matsubashi and should be allowed.

Rejection of Claim 10

The Examiner has furthermore rejected dependent Claim 10 under 35 U.S.C. § 103(a) as being unpatentable over Wong et al. in view of U.S. Patent No. 5,999,637 to Toyoda et al., which describes an individual identification apparatus for selectively recording a reference pattern based on a correlation with comparative patterns. Like Wong et al. (and unlike the claimed invention), Toyoda et al. does not describe the combination of a fingerprint scanner with a pointing device or any other feature of a mobile computer or other portable electronic device. Applicants respectfully traverse the Examiner's threshold finding that "Wong discloses the invention substantially as claimed in and as described above in claim 1" (Office Action at 4) and hereby incorporate by reference the discussion of the rejection of Claim 1 (from which Claim 10 depends) as set forth above. In addition, the passage from Toyoda et al. cited by the Examiner does not relate to "comparing successive, and possibly consecutive, images taken from a single period of contact of said finger with said scanner" (Claim 10) but instead discusses the possibility of taking multiple sets of fingerprints "from each of ten fingers of the specific person" so that a "most appropriate" set of such fingerprints may be selected as a reference set based upon specific standards. (Toyoda et al., column 16, lines 1-16) Applicants thus respectfully submit that a combination of Wong et al. with Toyoda et al. would not result in Claim 10 and that the claim is patentable over the references and should be allowed.

Rejection of Claims 14-27

Like Claim 1, independent Claims 14, 22, and 23 have been amended to clarify that each fingerprint scanner is "incorporated into a pointing device." As noted above, the

combination of a fingerprint scanner with a pointing device is a principal feature of the claimed invention. The Examiner has rejected Claims 14-27 on the basis that such claims are claiming subject matter combinations of rejected Claims 1-13 and are therefore rejected for the same reasons. Applicant respectfully traverses and submits that, in view of the foregoing discussion of Claims 1-13, Claims 14-27 should be allowed.

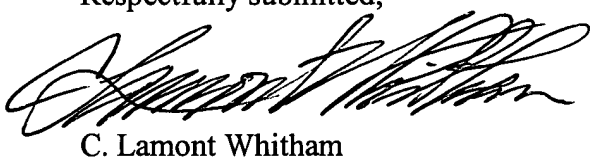
Conclusion

In view of the foregoing, it is respectfully requested that the application be reconsidered, that Claims 1 to 27 be allowed, and that the application be passed to issue.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

A provisional petition is hereby made for any extension of time necessary for the continued pendency during the life of this application. Please charge any fees for such provisional petition and any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041.

Respectfully submitted,



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